**What Is Claimed Is:**

1. A semiconductor device comprising:

a germanium substrate having a first type of doping;

a nucleation layer of group III-V materials disposed upon said germanium substrate, wherein the deposition of said nucleation layer also forms a germanium junction forming layer on a portion of said germanium substrate, said germanium junction forming layer being actively doped with a constituent element of said nucleation layer, said actively doped germanium junction forming layer having an opposite doping to said first type of doping;

at least one layer of a group III-V semiconductor material adjacent to and disposed upon said nucleation layer;

a device formed on one of said at least one layer of said group III-V semiconductor material, said device selected from the group consisting of transistors, resistors and diodes;

a first electrical contact formed on said germanium substrate; and

a second electrical contact formed on at least one of said at least one layer of a group III-V semiconductor material

2. The semiconductor device of claim 1, wherein said constituent element is selected from the group consisting of Phosphorus, Arsenic, and a combination of Phosphorus and Arsenic.

3. The semiconductor device of claim 1, wherein said germanium junction forming layer also being actively doped with a second constituent element from said at least one layer of said group III-V semiconductor material.

4. The semiconductor device of claim 1, wherein said second constituent element is selected from the group consisting of Phosphorus, Arsenic, and a combination of Phosphorus and Arsenic.

5. The semiconductor device of claim 1 further comprising a second device formed on another of said at least one layer of said group III-V semiconductor material, wherein said at least one layer of said group III-V semiconductor materials comprises a plurality of layers of said group III-V semiconductors materials, said second device selected from the group consisting of transistors, resistors and diodes.

6. The semiconductor device of claim 1, wherein the level of said first dopant is a function of a desired frequency operating range and photo-response characteristics of the semiconductor device.

7. The semiconductor device of claim 1, wherein said nucleation layer is lattice-matched to said germanium substrate.

8. The semiconductor device of claim 7, wherein said nucleation layer is an InGaP layer.

9. A method for forming a semiconductor device comprising the steps of:

(a) providing a germanium substrate having a first dopant;

(b) epitaxially depositing a first nucleation layer of a group III-V semiconductor material adjacent to and disposed upon said germanium substrate, wherein said nucleation layer is lattice-matched to said germanium substrate;

(c) epitaxially depositing a second nucleation layer as to cause a formation of a junction in said germanium substrate immediately adjacent to said first nucleation layer;

(d) epitaxially depositing at least one layer of a group III-V semiconductor material adjacent to and disposed upon said second nucleation layer;

(e) forming a first electrical contact on said germanium substrate;

(f) forming a second electrical contact on at least one of said at least one layer of a group III-V semiconductor material; and

(g) coupling said first electrical contact with said second electrical contact.

10. The method of claim 9, wherein (b) epitaxially depositing a first nucleation layer of a group III-V semiconductor material adjacent to and disposed upon said germanium substrate comprises (b) epitaxially depositing a first nucleation layer of a group III-V semiconductor material adjacent to and disposed upon said germanium substrate using metallo-organic vapor phase epitaxy.

11. The method of claim 9, wherein (b) epitaxially depositing a first nucleation layer of a group III-V semiconductor material adjacent to and disposed upon said germanium substrate comprises (b) epitaxially depositing a first nucleation layer of a group III-V semiconductor material adjacent to and disposed upon said germanium substrate using molecular beam epitaxy.

12. The method of claim 9, wherein (c) epitaxially depositing at least one layer of a group III-V semiconductor material adjacent to and disposed upon said first nucleation layer comprises (c) epitaxially depositing at

least one layer of a group III-V semiconductor material adjacent to and disposed upon said first nucleation layer, said at least one layer of said group III-V semiconductor material having a first composition, wherein said first composition is a function of the thickness of said nucleation layer.

13. The method of claim 9, wherein (c) epitaxially depositing at least one layer of a group III-V semiconductor material adjacent to and disposed upon said first nucleation layer comprises (c) epitaxially depositing at least one layer of a group III-V semiconductor material adjacent to and disposed upon said first nucleation layer, said at least one layer of said group III-V semiconductor material having a first composition, wherein said first composition is a function of the composition of said first nucleation layer.

14. The method of claim 9, wherein (c) epitaxially depositing at least one layer of a group III-V semiconductor material adjacent to and disposed upon said first nucleation layer comprises (c) epitaxially depositing at least one layer of a group III-V semiconductor material adjacent to and disposed upon said first nucleation layer, said at least one layer of said group III-V semiconductor material having a first composition, wherein said first composition is a function of the composition and thickness of said nucleation layer.

15. The method of claim 9, further comprising:

(h) forming a third electrical contact on at least one other layer of said at least one layer of a group III-V semiconductor material, said at least one other layer not intended for photosensitivity; and

(i) coupling said second electrical contact to said third electrical contact to form a microelectronic circuit.

16. The method of claim 9, further comprising:

(h) forming a third electrical contact on at least one other of said at least one layer of a group III-V semiconductor material, each of said at least one other of said at least one layers comprising a light sensitive growth layer; and

(i) coupling said third electrical contact to said first electrical contact to form a first device, said first device selected from the group consisting of an optoelectronic device and an optically-active device.

17. The method of claim 9, further comprising:

(h) forming a third electrical contact on at least one other layer of said at least one layer of a group III-V semiconductor material, said at least one other layer not intended for photosensitivity;

(i) forming a fourth electrical contact on at least one light sensitive growth layer of said at least one layer of a group III-V semiconductor material;

(j) coupling said second electrical contact to said third electrical contact to form a microelectronic circuit;

(k) coupling said third electrical contact to said first electrical contact to form a first device, said first device selected from the group consisting of an optoelectronic device and an optically-active device; and

(l) coupling said microelectronic circuit to said first device to form a single device, said single device having said microelectronic circuit and said optoelectronic device.

18. The method of claim 9, further comprising

(h) exposing said junction after step (d) but prior to step (e) using a conventional etching process.

19. The method of claim 9, wherein (e) forming a first electrical contact on said germanium substrate comprises (e) forming a first electrical contact on said germanium substrate using conventional photolithography techniques.

20. The method of claim 9, wherein (e) forming a first electrical contact on said germanium substrate comprises (e) forming a first electrical contact on said germanium substrate using conventional thin metal layer deposition techniques.

21. The method of claim 9, (f) forming a second electrical contact on at least one of said at least one layer of a group III-V semiconductor material comprises (f) forming a second electrical contact on at least one of said at least one layer of a group III-V semiconductor material using conventional photolithography techniques.

22. The method of claim 9, wherein (f) forming a second electrical contact on at least one of said at least one layer of a group III-V semiconductor material comprises (f) forming a second electrical contact on at least one of said at least one layer of a group III-V semiconductor material using conventional thin metal layer deposition techniques

23. A semiconductor device comprising:

a germanium substrate having a first type of doping;

a nucleation layer of group III-V materials disposed upon said germanium substrate;

at least one layer of a group III-V semiconductor material adjacent to and disposed upon said nucleation layer, wherein the deposition of said nucleation layer and said at least one layer also forms a germanium junction forming layer on a portion of said germanium substrate, said

germanium junction forming layer being actively doped with a constituent element of said nucleation layer and a second constituent element of said at least one layer, said actively doped germanium junction forming layer having an opposite doping to said first type of doping;

a device formed on one of said at least one layer of said group III-V semiconductor material, said device selected from the group consisting of transistors, resistors and diodes;

a first electrical contact formed on said germanium substrate; and

a second electrical contact formed on at least one of said at least one layer of a group III-V semiconductor material

24. The semiconductor device of claim 23, wherein said constituent element is selected from the group consisting of Phosphorus, Arsenic, and a combination of Phosphorus and Arsenic.

25. The semiconductor device of claim 23, wherein said second constituent element is selected from the group consisting of Phosphorus, Arsenic, and a combination of Phosphorus and Arsenic.

26. The semiconductor device of claim 23, wherein said second constituent element is selected from the group consisting of Phosphorus, Arsenic, and a combination of Phosphorus and Arsenic.